Amendments to the specification

At page 3 lines 23-28

At present, a first host associated with the multi-homed domain must select one of the two sets of IP addresses as a sender address for sending to a second host in ignorance of an actual state of the Internet; a fault condition arising in one of the connections associated with one of the two sets of IP addresses, can result in the first host becoming unreachable by [[a]] the second host located elsewhere in the Internet. This inability to reach the hosts contradicts one of the major motivations for multi-homing.

At page 5 line 15 to page 8 line 20

~~According to a first aspect of the present invention, there is provided a communications system comprising: a host operably connected to a first network entity having a first address space associated therewith, the first network entity being arranged to receive from a second network entity information relating to at least one address space, wherein the host is arranged to process the information relating to the at least one address space in order to ascertain an available return route for use by a communication in reply to an outgoing communication from the host.~~

~~Preferably, the information relating to the at least one address space is information relating to reachability of the at least one address space.~~

~~Preferably, the system further comprises a third network entity arranged to communicate information relating to an address space of the third network entity to the first network entity. More preferably, the first address space of the first network entity is inherited from the second network entity.~~

~~Preferably, the first network entity has a second address space associated therewith, the second address space of the first network entity being inherited from the third network entity. More preferably, the first network entity is arranged to communicate~~

~~the second address space to any network entities disposed hierarchically below the first network entity~~

~~Preferably, the first network entity is arranged to communicate the first address space to any network entities disposed hierarchically below the first network entity.~~

~~According to a second aspect of the present invention, there is provided a host apparatus for operably coupling to a first network entity, the first network entity having a first address space associated therewith and arranged to receive from a second network entity information relating to at least one address space, the apparatus comprising: a processing unit arranged to process the information relating to the at least one address space in order to ascertain an available return route for use by a communication in reply to an outgoing communication from the host.~~

~~Preferably, the first address space of the first network entity is a subset of the at least one address space.~~

~~Preferably, the first network entity has a second address space associated therewith, the second address space of the first network entity being inherited from a third network entity.~~

~~According to a third aspect of the present invention, there is provided a use for information relating to at least one address space received from a network entity by a host in order to ascertain an available return route for use by a communication in reply to an outgoing communication from the host.~~

~~According to a fourth aspect of the present invention, there is provided a method of ascertaining an available return route for a communication in reply to an outgoing communication from a host, the method comprising the steps of: communicating at least one address space from at least one network entity to the host; deducing the available return route from the at least one address space.~~

~~Preferably, the method further comprises the steps of: operably connecting the host to a first network entity having a first address space associated therewith, and the first network entity receiving from a second network entity the information relating to at least one address space.~~

~~Preferably, the method further comprises the steps of: providing a third network entity, and the third network entity communicating information relating to an address space of the third network entity to the first network entity.~~

~~Preferably, the first address space of the first network entity is inherited from the second network entity.~~

~~Preferably, the first network entity has a second address space associated therewith, the second address space of the first network entity being inherited from the third network entity.~~

~~Preferably, the method further comprises the step of: the first network entity communicating the first address space to any network entities disposed hierarchically below the first network entity.~~

~~Preferably, the method further comprises the step of: the first network entity communicating the second address space to any network entities disposed hierarchically below the first network entity.~~

~~According to a fifth aspect of the present invention, there is provided computer executable software code stored on a computer readable medium, the code being for ascertaining an available return route for a communication in reply to an outgoing communication from a host, the code comprising: code to communicate at least one address space from at least one network entity to the host, and code to make the host deduce the available return route from the at least one address space.~~

~~According to a sixth aspect of the present invention, there is provided a programmed computer for ascertaining an available return route for a communication in reply to~~

~~an outgoing communication from a host, comprising memory having at least one region for storing computer executable program code, and a processor for executing the program code stored in the memory, wherein the program code includes: code to communicate at least one address space from at least one network entity to the host, and code to make the host deduce the available return route from the at least one address space.~~

~~According to a seventh aspect of the present invention, there is provided a computer readable medium having computer executable software code stored thereon, the code being for ascertaining an available return route for a communication in reply to an outgoing communication from a host and comprising: code to communicate at least one address space from at least one network entity to the host, and code to make the host deduce the available return route from the at least one address space.~~

According to a first embodiment of a first aspect of the invention there is provided a communications system comprising a plurality of top-level domains each having a respective top-level address space; a next-level domain connected one of directly and indirectly to more than one of the plurality of top-level domains, the next-level domain having respective next-level address spaces which are subsets of the respective top-level address spaces of the more than one of the plurality of top-level domains; and a host connected to the next-level domain, the host having host addresses which are members of the respective next-level address spaces such that, when a route is available from any of the more than one of the plurality of top-level domains to which the next-level domain is connected, the next-level domain is arranged to receive information from the top-level domains having an available route, and the host is arranged to use the information to select, from the host addresses, for use as its source address on transmission, an address corresponding to a route which is available.

Preferably, the information is an address prefix of the host addresses.

Preferably, lifetimes are assigned to the information and the host selects an address corresponding to information having an unexpired lifetime.

Preferably, at least one intermediate domain is connected between the next-level domain and a top-level domain and the at least one intermediate domain forwards the information from the top-level domain to the next-level domain.

Preferably, the next-level domain is arranged to receive information from the at least one intermediate domain when a route is available from the at least one intermediate domain to the next-level domain.

Preferably, the information from the at least one intermediate domain includes an address prefix inherited from a top-level domain to which the intermediate domain is one of directly and indirectly connected.

According to a second embodiment of the first aspect of the invention there is provided a communications system comprising: a host operably connected to a first network entity having a plurality of address spaces associated therewith, each such address space corresponding to one of a plurality of second network entities to which the first network entity is connected, the first network entity being arranged to receive information from at least one of the plurality of second network entities from which a return route is available, wherein the host is arranged to process said information from at least one of the plurality of second network entities to select from the plurality of address spaces an address corresponding to such an available return route.

According to a second aspect of the invention there is provided a host apparatus having a processing unit, the host apparatus to connect to a next-level domain connected one of directly and indirectly to more than one of a plurality of top-level domains of a communications system, each top-level domain having a respective top-level address space, the next-level domain having respective next-level address spaces which are subsets of respective top-level address spaces of the more than one of the plurality of top-level domains; the host apparatus having host addresses

which are members of the respective next-level address spaces, and the processing unit being arranged to use information received by the next-level domain from the top-level domains when a route is available from said top-level domains to which the next-level domain is connected, to select from the host addresses, for transmission from the host apparatus, an address corresponding to a route which is available.

Preferably, the processing unit is arranged to use information which is an address prefix of the host addresses.

Preferably, lifetimes are assigned to the information and the processing unit is arranged to select an address corresponding to information having an unexpired lifetime.

Preferably, the processing unit is arranged to use information from at least one domain intermediate between the next-level domain and a top-level domain when a route is available from the at least one intermediate domain to the next-level domain.

Preferably, the processing unit is arranged to use information including an address prefix inherited from a top-level domain to which the intermediate domain is connected one of directly and indirectly.

According to a third aspect of the invention, there is provided a method of selecting an address for transmission by a host apparatus having a plurality of host addresses which are members of a respective plurality of address spaces of a next-level domain to which the host apparatus is connected, the next-level domain being connected one of directly and indirectly to more than one of a plurality of top-level domains of a communications system, each top-level domain having a respective top-level address space, the next-level domain having next-level address spaces which are subsets of the respective top-level address spaces of the plurality of top-level domains; the method comprising the steps of: the host receiving information forwarded by the next-level domain from at least one of the top-level domains when a route is available from said top-level domains to which the next-level domain is

connected; and using the information to select from the plurality of host addresses, for transmission by the host apparatus, an address corresponding to a route which is available.

Preferably, the information is an address prefix of the addresses and the step of using the information to select from the plurality of addresses comprises selecting an address having a prefix that is a best match to the received prefix.

Preferably, lifetimes are assigned to the information and the step of using the information to select an address comprises selecting an address corresponding to information having an unexpired lifetime.

Preferably, wherein at least one intermediate domain is connected between the next-level domain and a top-level domain, the step of receiving information from the next-level domain comprises receiving information forwarded by the at least one intermediate domain from the top-level domain to the next-level domain.

Preferably, wherein at least one intermediate domain is connected between the next-level domain and a top-level domain, the step of receiving information from the next-level domain further comprises receiving information from the at least one intermediate domain when a route is available from the at least one intermediate domain to the next-level domain

Preferably, the information from the at least one intermediate domain includes an address prefix inherited from a top-level domain to which the intermediate domain is one of directly and indirectly connected.

According to a fourth aspect of the invention, there is provided computer executable software code stored on a computer-readable medium for carrying out all the steps of a method of selecting an address for transmission by a host apparatus having a plurality of host addresses which are members of a respective plurality of address spaces of a next-level domain to which the host apparatus is connected, the next-level domain being connected one of directly and indirectly to more than one of a

plurality of top-level domains of a communications system, each top-level domain having a respective top-level address space, the next-level domain having next-level address spaces which are subsets of the respective top-level address spaces of the plurality of top-level domains; the method comprising the steps of: the host receiving information forwarded by the next-level domain from at least one of the top-level domains when a route is available from said top-level domains to which the next-level domain is connected; and using the information to select from the plurality of host addresses, for transmission by the host apparatus, an address corresponding to a route which is available.

Preferably, the information is an address prefix of the addresses and the step of using the information to select from the plurality of addresses comprises selecting an address having a prefix that is a best match to the received prefix.

Preferably, lifetimes are assigned to the information and the step of using the information to select an address comprises selecting an address corresponding to information having an unexpired lifetime.

Preferably, wherein at least one intermediate domain is connected between the next-level domain and a top-level domain, the step of receiving information from the next-level domain comprises receiving information forwarded by the at least one intermediate domain from the top-level domain to the next-level domain.

Preferably, wherein at least one intermediate domain is connected between the next-level domain and a top-level domain, the step of receiving information from the next-level domain further comprises receiving information from the at least one intermediate domain when a route is available from the at least one intermediate domain to the next-level domain

Preferably, the information from the at least one intermediate domain includes an address prefix inherited from a top-level domain to which the intermediate domain is one of directly and indirectly connected.

According to a fifth aspect of the invention, there is provided a programmed computer for carrying out all the steps of a method of selecting an address for transmission by a host apparatus having a plurality of host addresses which are members of a respective plurality of address spaces of a next-level domain to which the host apparatus is connected, the next-level domain being connected one of directly and indirectly to more than one of a plurality of top-level domains of a communications system, each top-level domain having a respective top-level address space, the next-level domain having next-level address spaces which are subsets of the respective top-level address spaces of the plurality of top-level domains; the method comprising the steps of: the host receiving information forwarded by the next-level domain from at least one of the top-level domains when a route is available from said top-level domains to which the next-level domain is connected; and using the information to select from the plurality of host addresses, for transmission by the host apparatus, an address corresponding to a route which is available.

According to a sixth aspect of the invention, there is provided a computer readable medium having computer executable software code stored thereon for carrying out all the steps of a method of selecting an address for transmission by a host apparatus having a plurality of host addresses which are members of a respective plurality of address spaces of a next-level domain to which the host apparatus is connected, the next-level domain being connected one of directly and indirectly to more than one of a plurality of top-level domains of a communications system, each top-level domain having a respective top-level address space, the next-level domain having next-level address spaces which are subsets of the respective top-level address spaces of the plurality of top-level domains; the method comprising the steps of: the host receiving information forwarded by the next-level domain from at least one of the top-level domains when a route is available from said top-level domains to which the next-level domain is connected; and using the information to

select from the plurality of host addresses, for transmission by the host apparatus, an address corresponding to a route which is available.

2073:0:0:0:5:400:102C:312F	2073::5:400:102C:312F
2B23:0:0:0:0:0:0:321	2B23::321
0:0:0:0:0:0:0:F	::F
0:0:0:0:0:0:0:0	::

Table 1

At page 11 lines 7-28

The Internet 102 comprises a first top level domain 200 connected, at the IP layer, to a second top level domain 202, the first and second top level domains constituting a default-free zone. The first top level domain 200 is connected, at the IP layer, to a first next level domain 204, and the second top level domain 202 is connected, at the IP layer, to a second next level domain 206. Both the first and second next level domains 204, 206 are respectively connected, at the IP layer, to a third next level domain 208, i.e. the third next level domain 208 is multi-homed. The first host 108 is, for example a Personal Computer (PC), and is connected, at the IP layer, to the third next level domain 208 via the first router 104. The first host 108 has a first IP address associated with a first route provided to the first top level domain 200, and a second IP address associated with a second route provided to the second top level domain 202. The first IP address is ~~part~~ a member of a first address space of the third next level domain 208, the first address space of the third next level domain 208 being a subset of an address space of the first next level domain 204, and is inherited therefrom. The address space of the first next level domain 204 is a subset of an address space of the first top level domain 200 and is inherited therefrom. Similarly, the second IP address is ~~part~~ a member of a second address space of the third next level domain 208, the second address space of the third next level domain 208 being a subset of an address space of the second next level domain 206 and is

inherited ~~therfrom~~ therefrom. The address space of second next level domain 206 is a subset of an address space of the second top level domain 202 and is inherited therefrom.

At page 13 lines 21-30

The first border router of the third set of border routers also injects (step 304) the first top level aggregator prefix T1::/16 to the third set of internal routers. Similarly, the first border router of the fourth set of border routers injects (step 304) the second top level aggregator prefix T2::/16 into the IGP in order to disseminate the top level aggregator prefix T2::/16 to the fourth set of internal routers. A first lifetime and a second lifetime is then administratively determined, in accordance with any suitable technique known in the art, and assigned (step 306) to the first top level aggregator prefix T1::/16 and the second top level aggregator prefix T2::/16, respectively ~~byall~~ by all of the third and fourth set of internal routers 214, 216.

At page 15 lines 25 – page 16 line 2

Under fault-free circumstances, the first host 108 can use the second source address associated with the second top level domain 202 in order to communicate with the second host 112. However, if the path between the second ~~level~~ next level domain 206 and the third next level domain 208 is withdrawn, the information provided by the third next level domain 208, enables the first host 108 to decide, if necessary, to use the first source address associated with the first top level domain 200 instead of the second source IP address associated with the second top level domain 202, thereby ensuring that an available return route exists for the second host 112 to use when sending datagrams to the first host 108.

At page 20 lies 18-30

Therefore, the first ~~host~~ router 104 communicates the first top level aggregator prefix T1::/16 and the second next level aggregator prefix T2:N2::/16+n2 to the first host 108. Hence, the first host 108 can execute an address selection procedure (Figure

5) in order to ensure that an unreachable host address associated with the first host 108, for example an IP address requiring the second route beyond the second next level domain 206, is not selected by the first host 108.

In order to better understand the route selection procedure, the procedure will now be described in relation to the first host 108 preparing to send a packet to the second host 112 having a host address that is used as a destination address for the packet, the host address of the second host being derived from the second top level domain 202 and the second next level domain 206, i.e. the first 16+n2 bits of the host address is T2:N2.

At page 21 line 31 – page 22 lines 3

Although the above examples have been described in the context of the third next level domain 208 being dual-homed, it should be appreciated that the above described system, apparatus and method is equally applicable to multi-homed domains. Additionally, although three tiers of domains have been described above, it should be understood that ~~the~~ a greater or fewer levels of domains can be provided.